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EXAMINER	
TOOM, IYAD F	

ART UNIT	PAPER NUMBER
3744	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/590,819	ZHAO, NINGFAN	
	Examiner	Art Unit	
	IYAD TOOM	3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 September 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *09/25/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claims 1-17 are objected to because of the following informalities: claim 1, line 8 recites “inlet/outlet ports”, replace by –inlet/outlet lines or supply/return lines or inlet/pipes" to improve the clarity of the claim language, the examiner after reading the specification refers to Para 62 which recites in lines 1-2 "the suction port of the compressor" and Para 63 , line 15 which recites "the suction port 17 of the condenser”, and fig. 1 which shows suction port 17 at the compressor, the applicant does not disclose the nature of the port other than that condenser and compressor share the same port, the examiner and conforming with the specification best interprets the port as a line or pipe. Appropriate correction is required.

Claims 2 and 12-17 are objected to because of the following informalities: claim 2, line 3 recites "the suction port", replace by --a suction port-- to improve the clarity of the claim language, in addition, claim 2, line 7 recites “the outlet port”, replace by –an outlet port—to improve the clarity of the claim language. Appropriate correction is required.

Claim 3 is objected to because of the following informalities: claim 3, line 4 recites “the refrigerating water temperature”, replace by –the refrigerating medium water

temperature-- to improve the clarity of the claim language. Appropriate correction is required.

Claim 4 is objected to because of the following informalities: claim 4, line 4 recites "supply and return", replace by –a supply and a return-- line 5 recites "at the load side", replace by –at a load side--, line 9 recites "the delivery pump", replace by –a delivery pump-- to improve the clarity of the claim language. Appropriate correction is required.

Claim 5 is objected to because of the following informalities: claim 5, lines 5-6 recite "the delivery pump", replace by –a delivery pump-- to improve the clarity of the claim language Appropriate correction is required.

Claim 15 is objected to because of the following informalities: claim 15, lines 5-6 recite "the delivery pump", replace by –a delivery pump-- to improve the clarity of the claim language Appropriate correction is required.

Claim Rejections - 35 USC § 103

Claims 1-3, 6, 13 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benedict et al. US Patent No. 6,463,748 listed on applicant's IDS in view of Shimoda et al., US Publication No. 2001/0003347.

In regard to claim 1, Benedict et al discloses a variable capacity modular combined refrigerating installation, which consists of multiple refrigerating modular units, each modular unit comprising one or more refrigerating cycles which includes a refrigerating medium and refrigerating compressor set, an evaporator and a condenser (col. 4, line 57- col. 5, line 11 disclose a modular unit that includes an evaporator, a condenser, and a compressor set, comprising: a frequency conversion motor (disclosed in col. 5, lines 10-11) and a compressor with magnetic suspension bearings disposed as part of the refrigerating compressor set(Benedict et al discloses in col. 4, lines 59-60 a compressor with magnetic suspension bearings) . Benedict discloses in fig. 2 sensing the flow rates of refrigerating medium at both of the condenser and the evaporator, However, Benedict does not disclose having a flow control valve for the refrigerating medium mounted at of the refrigerating medium inlet outlet ports of the evaporator, or having another flow control valve mounted at least one of the inlet or outlet ports of the condenser. Shimoda et al discloses in fig. 1, a refrigerating installation 1 which includes evaporator 20, a condenser 14 and a compressor 12, furthermore, Shimoda et al discloses a flow control valve 27 for a refrigerating medium at the outlet of the condenser and a flow control valve 41 at the outlet of the evaporator 20.
It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Benedict et al refrigerating system to include a flow control valve for refrigerating medium at the evaporator outlet and a refrigerating medium flow control valve at the condenser outlet as taught by Shimoda et al in order to effectively control

the refrigerating medium supply flowing through the evaporator and the condenser which helps improve the refrigerating system efficiency by providing a proper amount of refrigerating medium that matches a thermal load of the refrigerating system.

In regard to claim 2, Benedict et al discloses in fig. 9b, lines 18-21, col. 7, lines 2-3, col. 7, lines 39-43 measuring the inlet pressure and outlet pressure of the compressor using sensors, the claim limitations "for controlling the working capacity of the compressor set" and "for controlling the opening ratio of said flow control valve of cooling medium" are both intended use limitations of the sensors and in which Benedict et al sensors are capable of performing.

In regard to claims 3 and 13, Benedict et al discloses in fig. 2 a group of sensors that Benedict et al system has, one of them is ACH5 or evaporator temperature Te, as for the claim limitation of "for controlling the opening ratio of said flow control valve of refrigerating medium" this is an intended use of the sensor and in which Benedict et al temperature sensor Te is capable of performing.

In regard to claim 6 and 16, Benedict et al discloses in col. 10, lines 5-8 that the bearing has a position sensor connected to a bearing control unit, Benedict et al does not explicitly disclose having more than one bearing but having more than one bearing is a mere duplication of parts which involves only routine skill in the art, In re Regis Paper Co. v. Bemis Co., 193 USPQ 8. In addition, the compressor can have more than

one bearing depending on the configuration of the compressor and the way in which the compressor is mounted and it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Benedict et al. system to have more than one magnetic bearing in order to properly position the compressor and also give the compressor the ability to run at higher speeds.

Claims 4-5, 12 and 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benedict et al. and Shimoda et al as applied to claim 1 above and further in view of Conry, US Patent No. 5,070,704.

In regard to claim 4 and 14, Benedict et al does not disclose having a sensor for pressure difference between supply and return at the installation side and a sensor for pressure difference between supply and return at the load side in the refrigerating medium system to collect and transfer parameters of the pressure difference between supply and return for calculating and controlling a working frequency of the delivery pump. Conry discloses as in fig. 1 a heating/cooling system with a plurality of modular refrigeration units, Conry further discloses in fig. 1 and col. 4, lines 3-44 a pressure differential sensor 31 that measures the pressure difference between supply and return lines of the refrigerating circuit at the installation side, and control the speed (frequency) of a delivery pump 41. Conry does not disclose having another pressure difference sensor at the load side but it would have been an obvious mechanical expedient to provide a pressure difference sensor at the load side in order to closely monitor the

pressure difference in the system which better controls the pump load and helps maintaining a constant pressure differential in the system (this motivation is provided in col. 4, lines 43-44). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Benedict et al system to include a pressure sensor for measuring a pressure difference between supply and return lines in the installation side as taught by Conry in order to maintain a proper pressure differential throughout the system which helps maintaining proper amount of refrigerating medium flow and helps further in regulating the delivery pump capacity to match the system load.

In regard to claim 5 and 15, Benedict et al does not disclose a sensor for pressure difference between supply and return at the installation side in the cooling medium system to calculate and control a working frequency of the delivery pump. Conry discloses in fig. 1 and col. 4, lines 43-44 a pressure difference sensor 31 that measures pressure difference between supply and return lines of cooling medium system at the installation side to control the speed (frequency) of delivery pump 14. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Benedict et al system to include a pressure sensor for measuring pressure difference between supply and return lines of cooling medium system in the installation side as taught by Conry in order to maintain a proper pressure differential in the system which helps controlling the capacity of the delivery pump 14, thus maintaining a proper amount of cooling medium flow through the condenser which helps in increasing the system efficiency by properly cooling the condenser.

In regard to claim 12, Benedict et al discloses in col. 5, lines 12-13 that the modular unit (chiller) is controlled using a microprocessor controller. Benedict et al does not disclose that the modular unit is part of a general circuit that has a plurality of modular units, or having a master controller as being part of the general circuit. Conry discloses in the Abstract and fig. 1 a refrigerating system with a plurality of modular units (chillers) similar to Benedict modular unit (chiller). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Benedict et al system to include more than one modular unit (chiller) as taught by Conry in order to add more flexibility to the cooling system by providing different modular units to cool different zones and also adds more reliability to the system by maintaining a proper cooling even if one of the modular units is not operating properly. Conry also discloses as in fig. 2 and col. 4, lines 56-66 having a master controller 34 to control the refrigerating circuit in addition to microprocessor controllers 38 at each modular unit. It would have been obvious to modify Benedict et al system to include a master controller as taught by Conry in order to have a remote control of the modular unit which makes it easier to remotely monitor and control the different parameters of the modular unit without the need to be in close proximity to the unit, thus saving the operator's time.

Claims 7 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benedict et al. and Shimoda et al as applied to claim 1 above and further in view of Peze, US Patent No. 5,494,100.

In regard to claims 7 and 17,Benedict et al discloses in the Abstract having an evaporator, and further discloses in fig. 2 that the evaporator has two media, i.e. refrigerant and a water, in which the refrigerant cools the water, it is normally known that evaporators that have a refrigerant and water as the media, must have two kinds of medium flowing channels which are isolated from each other to function properly, i.e. Benedict et al evaporator is the kind in which refrigerant cools water, this kind of evaporator has two different channels that are isolated from each other, one being for refrigerant and the other being for the water to be cooled. However, Benedict et al does not disclose that the evaporator is a plate heat exchanger of full liquid evaporation type (this is intended use of the evaporator and Benedict et al evaporator is capable of performing that function). Benedict et al does not also disclose that the evaporator has an inner core and an outer shell, said core is formed by welding a certain number of metal plate of certain geometric shape according to a predetermined rule (this limitation is a method of forming the evaporator and is not germane to the issue of patentability of the evaporator itself. Therefore, this limitation has not been given patentable weight). Benedict et al does not disclose an outer shell is a barrel shaped container with a circle or square section. Peze discloses in figs. 12-14 a plate type heat exchanger with inner core M (see fig. 13) and an outer shell 11, figs. 12-13 show plates that are disposed in

the inner core M, fig. 14 shows the shell with a barrel shaped container and fig. 13 shows that the shell has a circular cross section, in addition, fig. 14 shows 2 kinds of channels (fig. 14 shows one channel corresponds to location A, the other channel corresponds to location B. Furthermore, Peze discloses in col. 2, lines 29-33 two different media flow through the channels, Medium A and Medium B). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Benedict et al evaporator to have to be a plate type heat exchanger with inner core and outer shell, and making the outer shell barrel shaped with a circular cross section as taught by Peze in order to make the evaporator more compact and to increase the heat transfer between the different fluids flowing in the heat exchanger.

Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benedict Shimoda et al and Peze as applied to claim 7 above and further in view of Taylor, US Patent No. 4,850,197.

In regard to claim 8, Benedict et al does not disclose that the modular unit is provided with an economizer and the liquid cryogen (broadly interpreted as a refrigerant and which Benedict discloses (see fig. 2 which discloses refrigerant flow rate sensor to indicate a refrigerant flowing in the system) from the condenser is divided is divided into two parts, one part after being throttled supercools the other part, while said one part absorbs heat and evaporates itself. Taylor et al discloses in fig. 1 an economizer 34 with two parts (first part is 38 the other part is 36, col. 3, lines 3-17 disclose that the first part

38 after being throttled (through throttling valve 56) supercools (since the condenser normally cools the refrigerant to a 100 percent liquid) the other part 36, and then the first part 38 evaporates by absorbing heat from the other part 36 and flows back to the compressor as shown in fig. 1). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Benedict et al system to include an economizer with two parts in which one part after being throttles supercools the other part and then evaporates in order to enhance the cooling cycle (which increases cooling efficiency) and decrease the load on the compressor (Taylor et al discloses this motivation in col. 1, lines 13-22 and col. 3, lines 16-17).

In regard to claim 9, Benedict et al discloses in the Abstract having an expansion device Benedict et al does not explicitly disclose that the expansion device is disposed between the condenser and the evaporator, but the expansion device is normally disposed between the condenser and the evaporator (part of the thermodynamic cycle of refrigeration there has to be a throttling means between the condenser and the evaporator in order for the refrigeration cycle to function properly), furthermore in regard to the limitation of "liquid level control throttling expansion device" it is an intended use of the throttling device and Benedict et al throttling device is capable of performing this function.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Benedict, Shimoda et al, Peze and Taylor et al as applied to claim 8 above and further in view of Ichikawa, US Patent No. 5,249,432.

In regard to claim 10, Benedict et al does not disclose having a gas-liquid separator mounted between the suction port of the compressor and the plate heat exchanger of full liquid evaporation type. Ichikawa discloses in fig. 1 gas-liquid separator 14 mounted between the compressor suction 105 and the evaporator 44, 34 and 24. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Benedict et al system to include a gas-liquid separator mounted between the compressor suction line and the evaporator in order to prevent the introduction of liquid into the compressor suction which could damage the compressor, in addition having a gas-liquid separator improves the performance and efficiency of the compressor by introducing superheated gas into the compressor suction which reduces the power needed by the compressor to compress the refrigerant gas.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to IYAD TOOM whose telephone number is (571)270-7395. The examiner can normally be reached on 7:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frantz Jules or Cheryl Tyler can be reached on 571-272-6681 or 571-272-4834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

6/11/2009
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Examiner, Art Unit 3744

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